

# NATURAL AND ARTIFICIAL HYBRIDS OF CACALIA ATRIPLICIFOLIA AND C. MUHLENBERGII

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In the summer of 1961, the author undertook, at the suggestion of Dr. Charles B. Heiser, Jr., an investigation of those species of *Cacalia* found in Indiana. This involves four species: *C. atriplicifolia* L., *C. muhlenbergii* (Sch. Bip.) Fern., *C. suaveolens* L. and *C. tuberosa* Nutt.

The two species *Cacalia atriplicifolia* and *C. muhlenbergii* are morphologically rather similar, differing primarily in the following characters:

<i>C. atriplicifolia</i>	<i>C. muhlenbergii</i>
1. Stems glaucous	1. Stems not glaucous
2. Stems terete	2. Stems grooved and angular
3. Leaves white beneath	3. Leaves green beneath
4. Basal leaves triangular-ovate	4. Basal leaves reniform
5. Leaves essentially glabrous	5. Leaves pubescent

Whereas *Cacalia muhlenbergii* occurs primarily in rich, shaded woods *C. atriplicifolia* occurs primarily in dry, open woods.

The author found one locality (Cedar Bluff, Monroe Co., Ind.) at which populations of the two species were growing within 200 feet of one another. The area is a rich woods penetrated by an abandoned road. *Cacalia muhlenbergii* was growing primarily in the shaded areas to the sides of the road, and *C. atriplicifolia* was growing in the clearing of the road. One plant, occurring at the edge of the *C. atriplicifolia* population toward the *C. muhlenbergii* population, showed intermediacy for the characters separating the species. However, the stalk was broken off before sexual maturity was reached thereby preventing an examination of meiosis and pollen stainability.

The rootstock of the putative hybrid was transferred into the greenhouse at Indiana University as were mature plants of the parental species. Crosses were made between *Cacalia atriplicifolia* and *C. muhlenbergii* with the former as the female parent. Of the 165 florets crossed, 7.5% developed seeds.

The putative hybrid seeds were planted in the spring of 1962 and placed out-of-doors for a two week cold treatment. They were then transferred to the greenhouse where they germinated and appeared healthy but did not produce flowering stalks. The putative natural hybrid behaved similarly. The plants remained in the greenhouse until the fall of 1963 without flowering.

In the fall of 1963 the putative natural hybrid and two putative artificial hybrids were transferred to the experimental garden at Indiana University. All three flowered in the summer of 1964. Pollen stainability with cotton blue (based on 200 grains) was 2.0% for the natural hybrid and 3.0% and 9.5% for the artificial hybrids. The lack of seed-set observed in these hybrids accounts for the failure to detect hybridization in the Cedar Bluff populations.

An examination of meiosis, using acetocarmine squash methods, revealed both bivalents and univalents (Fig. 1). However, since the bivalents have a tendency to dissociate even in the parental species, the exact number of true univalents could not be accurately determined. Laggards were observed at anaphase (Fig. 2) as were "tetrads" with micronuclei.

The chromosome count of *Cacalia muhlenbergii* has been reported as  $2n=50$  (Afzelius in Darlington and Wylie, 1955), of *C. atriplicifolia* as  $n=25$  (Jackson, 1962) and *C. suaveolens* as  $2n=40$  (Afzelius in Darlington and Wylie, 1955). Counts by the author confirm these reports. An examination of *C. tuberosa* revealed  $n=27$  (Fig. 3) (voucher: Cabin Creek Bog, ca. 6 mi. n. of Modoc, Randolph Co., Ind. *Coleman 101* IND). Other numbers reported for the genus are  $2n=52$  (2 species) and  $2n=60$  (4 species) (Darlington and Wylie, 1955 and Takeshita, 1961).

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Fig. 1. Diakinesis of natural hybrid showing bivalents and univalents.

Fig. 2. Anaphase 1 of artificial hybrid showing laggards.

Fig. 3. Diakinesis of *Cacalia tuberosa*,  $n=27$ .



Fig. 1



Fig. 2

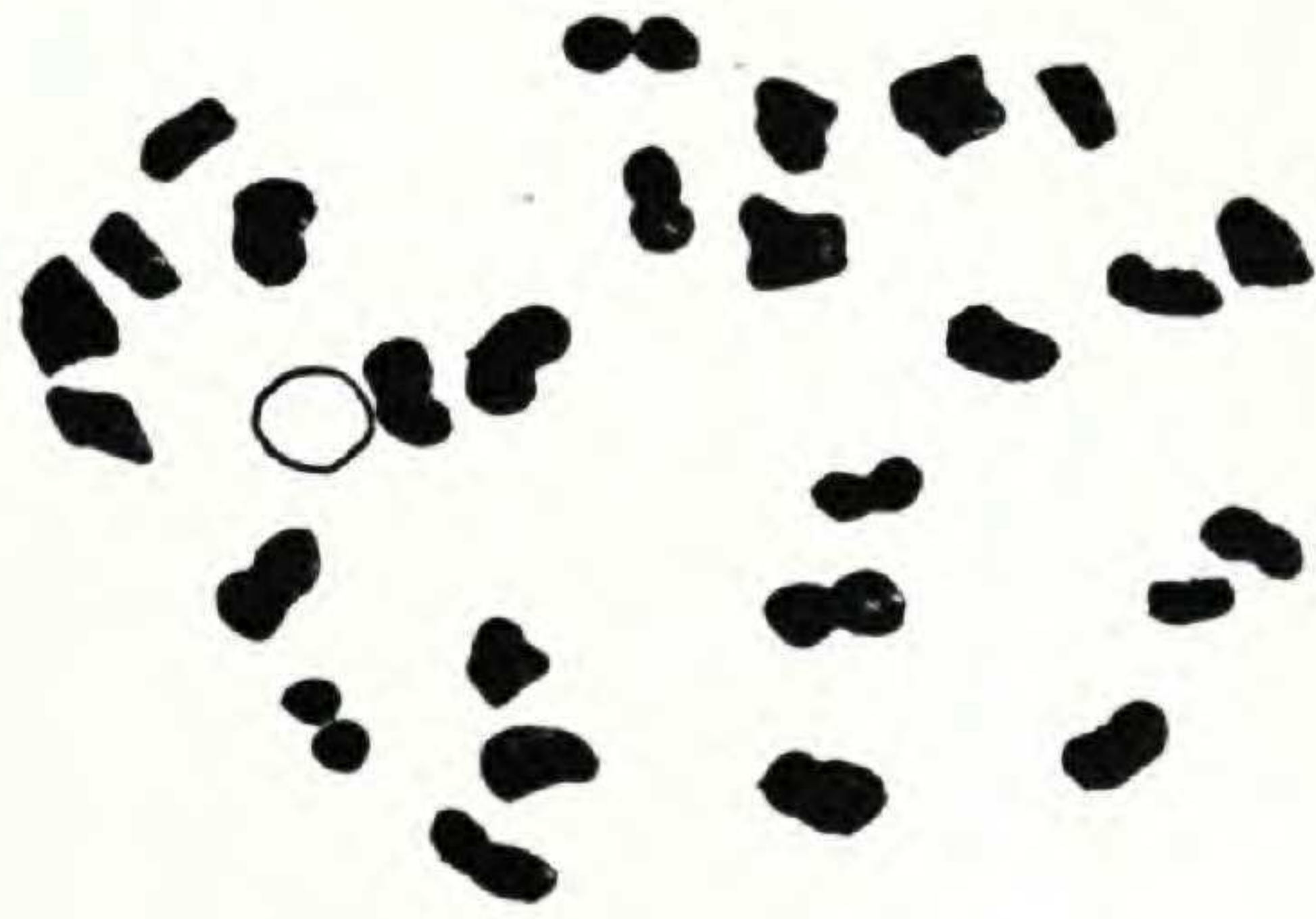


Fig. 3

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